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ABSTRACT

Case study analyses of nine mildly handicapped elementary students were conducted to identify factors related to gains in achievement and to higher active academic responding times (ART) in relation to different student-teacher ratios. Six learning disabled and three educable mentally retarded students (grades 3-5) were observed in special education settings under different student-teacher ratios. Information was collected on each student in the areas of aptitude, achievement gains during a one-year period, behavior, the nature of home, school, and community learning environments, methods of instruction, and the student's academic engaged time (and other times) under different student-teacher ratios. Results indicated considerable inter-individual and intra-individual variability in all factors examined, but few consistent trends. Among conclusions discussed is that ART changes in relation to several variables, particularly the content area of instruction, the nature of the task, and environmental distractions. The data also seemed to indicate that the special education categorical label assigned to a student does not determine the effectiveness of different student-teacher ratios. Results suggested that ART is higher when the method of instruction is some form of direct instruction. (JW)

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University of Minnesota

RESEARCH REPORT NO. 14

A CASE STUDY ANALYSIS OF FACTORS RELATED TO EFFECTIVE STUDENT-TEACHER RATIOS

James E. Ysseldyke, Martha L. Thurlow,
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Abstract

Case study analyses were conducted on nine students who were observed in special education under different student-teacher ratios, with the goal being to identify factors related to gains in achievement and to higher active academic responding times in relation to different student-teacher ratios. Information was collected on each student in the areas of aptitude, achievement gains during a one-year period, behavior, the nature of home, school, and community learning environments, methods of instruction, and the student's academic engaged time (and other times) under different student-teacher ratios. Results indicated considerable variability in all factors examined, but few consistent trends. Implications of the variability are discussed.

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A Case Study Analysis of Factors Related to Effective Student-Teacher Ratios

It is probably a fairly widely held belief that students learn better when they are taught within classes that have lower student-teacher ratios (STRs). Research, in fact, has provided evidence for this belief. The research has occurred almost exclusively in general education classrooms, where it is typical to find one teacher in a room with 25 to 30 students (STR = 25:1 to 30:1). In 1978, Glass and Smith conducted a meta-analysis of studies of student-teacher ratios. Their overall findings indicated that student achievement increased as class size decreased, but that there was little increase in achievement until the STR fell below 15:1. However, even when STRs were above 15:1, decreases in STR led to more positive attitudes by both students and teachers.

Project Prime Time was undertaken with the specific goal of reducing STRs in grades kindergarten through third to 14:1, with the rationale that those were the grades when students learned to read (after those grades students read to learn). The results of this study showed that reducing ratios led to an increase in student achievement and a decrease in behavior problems; furthermore, teachers reported feeling more effective in the classroom (Bain & Achillies, 1986). Filby, Cahen, McCutcheon, and Kyle (1980) reported that in classes with lower STRs, the students achieved more individual teacher attention, spent more time on task, were presented with more enrichment activities, and had fewer discipline problems.

At the same time that research has provided some support for the desirability of reduced class sizes, there has been a trend toward decreasing the STR in general education classrooms, from approximately 35:1 to approximately 24:1 (Glass, Cahen, Smith, & Filby, 1982). Yet, there is a large

economic cost factor that needs to be considered. Glass et al. (1982) estimated tnat in a district of 50,000 students, to reduce the average STR by 1 (e.g., 15:1 to 24:1) would cost more than $1 million. An Associated Press story estimated the cost of reducing the current STR across the nation down to 15:1, the ratio at which Glass et al. stated that significant increases in achievement would occur, to be $69 billion. Teachers want smaller classes so they can be more effective teachers, while administrators want larger classes to save money. The key for decision making is to determine the cutoff point where the drop in student achievement is no longer worth the financial savings with larger classes.

Despite the considerable attention given to STR effects in general education, we find little information about the effectiveness of different ratios in special education. Information from research in general education classrooms is not directly applicable, for the most part, because special education classes are already much smaller than general education classrooms. A recent survey of special education teachers indicated that most STRs range from 1:1 to 15:1, with an average of about 5:1 (Ysseldyke, Thurlow, & Wotruba, in press). It is generally assumed that part of the benefit of special education is that instruction can be provided to students within smaller groups. The extent to which the student-teacher ratio in special education is smaller than in regular education has not been related to differences in instructional outcomes for students.

Although some researchers have addressed the effects of different STRs in classrooms for students with severe handicaps (Alberto, Jones, Sizemore, & Doran, 1980; Baker, 1980; Snart & Hillyard, 1985), very few have studied STRs in

classrooms involving students with mild handicaps, those who make up the majority of students served in special education. In two studies, different group sizes for preschool students were compared (Fink & Sandall, 1978, 1980), and in another two, elementary students were involved (Forness & Kavale, 1985; Jenkins, Mayall, Peschka, & Jenkins, 1974). These studies do not provide a common data base for comparing classes with more than eight students and with less than eight students.

It is doubtful that a simple relationship exists between student-teacher ratio and student achievement or academic engaged time. More likely will be findings that show a given class size being conducive to engaged time and academic progress for one student, but not for another. Learning reflects a complex interaction of child characteristics, teacher characteristics, nature of intervention, intervention setting, and desired target behavior. Very possibly, specific student characteristics, or student-teacher interaction characteristics, are related to student performance in smaller or larger class sizes.

The purpose of this research was to begin to investigate some of the possible factors related to effective student-teacher ratios through a case study format. Data on types of student characteristics were examined, as well as data indicative of student-teacher interactions. Detailed reports were written for cases selected for inclusion (those in which the student was observed in more than one student-teacher ratio during special education time). From tnese detailed reports, conclusions were drawn regarding possible relationships among student characteristics, student-teacher interactions, task completion and success, and student-teacher ratio.

Method

Subjects

Nine elementary students who were receiving special education services were subjects for this intensive case study analysis. These students were selected from a larger sample of 23 students for whom data had been collected on aptitude, achievement, and behavior measures, as well as on various aspects of tne student's total learning environment. The criterion for selection was that during tne special education period in which observations were conducted, the student received instruction in more than one student-teacher ratio; 13 students were eliminated because they did not meet this criterion. All of the remaining students except one received academic instruction within the special education setting. The one exception received only social skills instruction. Because of this difference, the decision was made to eliminate this student from case study analysis also.

The nine students included four girls and five boys from seven schools in two school districts. Descriptive information about the students is included in Table 1. Specific characteristics are presented in each case study.

Materials

Both standardized assessment instruments and project-developed measures were used to collect information on a variety of student factors and related environmental conditions. The variables of interest were: aptitude; achievement; behavior; home, school, and community learning environments; and methods of instruction. These were examined in relation to the student's academic responses.

Table 1

Information on Students Included in Case Studies

Case	Gender	Category	Race	Age	Grade	Observed STRs
1	F	LD	White	8	3	1:1, 2:1
2	F	LD	White	9	3	2:1, 7:2, 6:1
3	M	LD	Hispanic	11	3	3:1, 8:1
4	M	EMR	White	11	3	7:1, 9:1
5	F	EMR	White	10	4	3:1, 4:1
6	M	LD	White	10	5	1:1, 2:1
7	M	LD	Black	11	5	8:1, 9:1
8	F	EMR	Native American	11	5	2:1, 3:1, 4:1
9	M	LD	Black	12	5	2:1, 4:1

Aptitude. The Wechsler Intelligence Scale for Children - Revised (WISC-R; Wechsler, 1974) was used. Scores were obtained for verbal, performance, and full scale IQ.

Achievement. Achievement data were collected through the use of a standardized measure, the Basic Achievement Skills Individual Screener (BASIS; Psychological Corporation, 1983), and an informal direct measure of reading. The Math, Reading and Spelling subtests of the BASIS were used. Standard scores and percentile for both grade and age norms were examined for the case study analysis. The informal direct measure of reading was a common passage taken from Holt Reading Series at the third grade level. The same passage was used with all students, and measures of both words correct and incorrect within a one-minute sample were obtained.

Behavior. Information on each student's behavior was collected using the Behavior Rating Profile (BRP; Brown & Hammill, 1978). The BRP consists of 30 statements on forms for the teacher, parents, and student that are rated as being like or not like the student. Total scores were obtained for the teacher and parent forms. For the student form, scores for home, school, and peers were calculated.

Home, school, and community learning environments. A measure called "Conditions in the Learning Environment Scale" (CLES) was developed for use in this and related research. The CLES consists of 10 statements that identify important conditions which, when they exist in the home, school (via teachers and principals), and community, enhance the total learning environment for the student. The statements were based on the description presented by Samuels (1986) of conditions that deem a child ripe for academic failure. Each of the

10 statements, which are listed in Table 2, was rated on a 4-point Likert-type scale with a "1" indicating that the item was "not at all like the student's learning environment" and "4" indicating that the item was "very much like the student's learning environment."

Methods of instruction. The methods of instruction that were used during an observation period were recorded using a Methods of Instruction form on which 10 general types of instructional methods were listed, followed by two columns of blank lines on which to record the time and the identification number of the instructional method. The 10 instructional methods were: (a) direct instruction, (b) discovery/inquiry, (c) teacher demonstrate, student demonstrate, seatwork, (d) lecture/films, (e) discussion, (f) cooperative learning, (g) independent work, (h) correcting papers, (i) testing, and (j) practice/drill.

Academic responding. Observational data on the student's responses were collected using the Code for Instructional Structure and Student Academic Response (CISSAR) developed at Juniper Garden Children's Project, University of Kansas, by Greenwood, Delquadri, and Hall (1978). This system focuses on the behavior of one target student. In the original system, 19 student response codes were defined. These were combined to form three composite variables: active academic responses, task management responses, and inappropriate responses. In this study, one of the inappropriate responses (self-stimulation) was deleted and another task management response (waiting) was added. "Waiting" was defined as time when the student is not involved in any response and the situation involves an obvious "wait" time such as when the student is in line, teacher stops lecture to answer telephone, etc. (see Stanley & Greenwood, 1980,

Table 2

Statements in the Conditions in the Learning Environment Scale

1.	The home is supportive of school efforts.
2.	The community is supportive of school efforts.
3.	The student appreciates the value of hard work and education.
4.	High moral standards and values are fostered in the home.
5.	Members of the home help the child with schoolwork.
6.	Strong administrative leadership exists in the school.
7.	A rationale for working hard in school has been provided.
8.	The teaching style is task-oriented and humanistic.
9.	There is a strong belief that the school makes a difference for its students.
10.	The student's attitude toward school and learning is positive.

for definitions of other student response codes). The decision to make this change was based on previous observational studies, which found minimal self-stimulation behavior, but a great deal of waiting time.

A momentary time sampling technique was used to direct the recording of events. Portable computers were used both to direct the timing of observations and to enter data during the observation. The computers were programmed to show the codes from which the observer selected every 10 seconds. After the observer entered information about the target student, the number of students in the class, and the number of adults, the observer entered information about the content area, the task in which the student was engaged, and the structure in which instruction was received (entire group, small group, individual). This type of ecological screen was repeated every 70 seconds. During the 60 seconds between the ecological screens, the computer showed the student response codes from which the observer selected appropriate codes every 10 seconds. The program also allowed the observer to exit the 10-second interval screens when it was necessary to change information on the numbers of students or teachers.

In order to aggregate the data for individual subjects, the 10-second ecological information was attached to the student response information. This resulted in 60 seconds of student response data for each 70 seconds of actual observation time. Data were then summarized as percentages of time.

When summarizing CISSAR data, four composite variables were formed from the 19 coded student response variables. Three of the composites were ones recommended by Stanley and Greenwood (1980):

Active Academic Responses: Writing, Playing academic game, Reading silently, Reading aloud, Talking appropriately, Asking academic questions, Answering academic questions

Management Responses: Raising hand, Looking for materials, Moving to new learning station, Playing appropriately, Passive attending, Waiting

Inappropriate Responses: Disruption, Playing inapproriately, Inappropriate task, Talking nonappropriately, Inappropriate locale, Looking around

In addition, since much of the literature on instructional time focuses on engagement rates (e.g., Anderson, 1984; Karweit, 1983), an Academic Engaged Time composite was formed. This variable included the seven codes that form "active academic responses," plus the "passive attending" code.

Procedure

Data collection activities were conducted by a cadre of observers and research assistants during a six month period for all but achievement testing. Achievement tests were administered both at the end of the preceding academic year and at the end of the academic year in which observational data were collected.

Completion of the CLES was not attempted until social and emotional measures had been administered and interviews had occurred with the student's parent, teacher, and principal. The social-emotional measures included A Scale of Intrinsic Versus Extrinsic Orientation (Harter, 1980) and Student Cognitions questionnaire, in addition to the BRP already described. Further information on these other measures, which were not analyzed directly in the case studies, may be found in Ysseldyke, Bakewell, Christenson, Muyskens, Shriner, Cleary, and Weiss (1988).

Interviews with parents were conducted in the students' homes. Most interviews lasted approximately one hour, and parents were paid $15.00 for their participation. Interviewers were research assistants who had been trained systematically in the interview techniques in a paired fashion. The two

individuals who developed the semi-structured interview each conducted a home interview while a trainee watched. After the interview, ratings were recorded by both and then compared. The ratings were on a 4-point scale, with "1" indicating "not at all like the child's home environment," and "4" indicating "very much like the child's home environment. The trainee then conducted a home interview while the trainer observed; ratings again were compared. Training continued until both members of the pair were confident that the trainee was ready to interview independently and inter-rater agreement met a minimal standard.

Inter-rater agreement was calculated in two ways: Grouped and Exact. For grouped agreement, ratings of 1 and 2 were combined and ratings of 3 and 4 were combined. The minimal predetermined standard of agreement between the two interviews was 7 out of 9 items, or 78%. Exact agreement occurred when both interviewers coded the exact same rating on the 4-point scale; agreement had to reach a minimal standard of 56% (i.e., 5 out of 9 items). After trainees were competent interviewers, they trained other interviewers. Inter-rater agreement was checked 14 times during the study on 7 pairs of interviewers. Average inter-rater agreement for grouped items was 91.3%; exact agreement was 70.6%.

Interviews with teachers were scheduled and conducted by research assistants also. In these interviews, which lasted about 20 minutes, the teacher was asked seven open-ended questions related to (a) advantages and disadvantages of teaching in general, and in their current school, (b) amount of stress experienced from teaching students with handicaps, (c) administrative leadersnip in the school, and (d) degree of parental support for teacher efforts and recommendations.

Interviews with principals were conducted over the telephone by either the project scheduler or a research assistant. These interviews were very short (approximately 5 minutes) and simply asked the principal about community support of school efforts.

A Scale of Intrinsic Versus Extrinsic Orientation in the classroom (Harter, 1980) contains 30 items grouped into five subscales: Challenge, Curiosity, Mastery, Judgment, and Criteria. Although called a social-emotional measure, it actually is designed to assess the student's extrinsic-intrinsic motivation on the five subscales, and the student's ability to make judgments about personal performance and overall orientation to dealing with tasks in school. Higher scores on these subscales indicate an intrinsic orientation toward motivation in the classroom.

The Student Cognitions Questionnaire is a modification of a self-report Cognitive Processing Questionnaire developed by Peterson, Swing, Stark, and Waas (1984). The questionnaire, which was developed to measure a student's active thinking during instruction, included 21 items grouped into five subscales: Poor Listening, Positive Listening, Cautious Style, Active Thinker, and Understanding.

To complete the CLES (refer to Table 2), the various pieces of information were used to rate specific items by the person who had adminstered the relevant measure. Items 3, 7, and 10 were completed after social-emotional testing. The parent interviewer rated CLES items 1, 4, 5, and 7, which focused on the home learning environment. Items 6, 7, 8, and 9 were rated after the teacher interview, and item 2 was rated after the interview with the principal. All items were rated on a 4-point Likert-type scale, with "1" indicating "not at all

like the child's learning environment" and "4" indicating "very much like the child's learning environment."

Analysis

The case study analyses were conducted at a descriptive level. Information about each student was examined and then summarized in terms of characteristics of the student, the special education setting, achievement levels and changes, and any potential relationships among student-teacher ratios and outcomes. At the end of each case study report is a brief summary.

The nine case studies are then integrated in the Discussion section. An attempt is made to identify common themes emerging from the case study analyses.

Results

The nine case studies are reported here, ordered according to the students' grade levels, and then by age within grade level. Each case has been given a fictitious name.

CASE #1: Deborah

The Student

Deborah is a white, female, 8-year-old, third grader at a suburban elementary school. She is classified as a learning disabled (LD) student, and receives services in both regular and special education settings. Her full scale IQ on the WISC-R is 118 (verbal IQ = 127, performance IQ = 104). Deborah is described by the regular and special education teachers on the BRP as a defiant child who is an academic underachiever. Both teachers describe her as lacking motivation, inconsistent with homework assignments, and unable to

maintain concentration on schoolwork. Her social relationships with peers are said to be somewnat immature (e.g., instances of tattling and self-centered behavior). Deborah's parents describe her in similar terms on the BRP. They report her to be self-centered, demanding of attention, and somewhat disobedient and unreliable. Deborah's BRP self-report contains references to problems in peer relations. She reports being considered "a baby" by peers, being angry about the way she is treated by other children, and experiencing teasing by the other children. Despite these seemingly negative reports, both from parents and Deborah herself, scaled scores from teacher ratings on the BRP are within normal limits in normative comparisons.

The CLES questionnaire was used to measure the current learning environment of the student. The home and community are seen as strongly supportive of school efforts. There is strong administrative leadership, a belief that school makes a difference for its students, and help on schoolwork available from the home. Teachers are seen as helpful and humanistic. Deborah, however, is described as not likely to appreciate the value of hard work or education, and tnere is some doubt on the part of the special education teacher and the parents that a rationale for working hard has been provided in the child's current environment.

The Special Education Setting

Deborah was scheduled to receive resource room instruction for a 30-minute period. She actually received instruction for 18 minutes on the day she was observed. Deborah spent only one third of a minute in a 3:1 STR engaged in transition between activities. Thirteen minutes (71%) were observed in a 1:1 STR and 4.17 minutes in a 2:1 ratio. The primary activity of the 1:1 STR was

mathematics; spelling was the activity in the 2:1 situation. Instruction in the 1:1 and 2:1 ratios was on an individual basis.

Achievement

Deborah's achievement in math, reading, and spelling was measured on the BASIS. Her percentile ranks and standard scores for the test given in the spring of 1986 and the spring of 1987 are shown in Table 3.

During the time period of the investigation, Deborah showed a significant decline in math achievement scores. Grade percentile rank dropped from 80 to 13; age percentile rank dropped from 94 to 29. Grade and age standard scores in math each fell about 30 points. The student also declined in reading achievement scores during the year. Grade-referenced percentile ranks declined by about half (32 to 16). Age-referenced scores also declined (percentile rank 56 to 32). Curriculum-based measures (CBM) on a standard reading passage, however, showed an increase of 42 words read correctly per one minute sample (22-64) over the one year period.

Deborah made gains in spelling achievement measures. Raw score change was nine points (10 to 19). Grade-referenced scores increased modestly (percentile rank 13 to 28; standard scores 83 to 91). Age-referenced scores showed the same modest increases (percentile rank 32 to 46; standard score 93 to 98).

For measures of task completion and success in the resource room, the number possible, number attempted, and number correct were counted. Deborah was given seven multiplication problems to solve, nine reading flashcards to pronounce, and five sentences to write. She performed all tasks completely and with 100% accuracy. The limited time available in the resource room reduced the number of items assigned for each task.

Table 3

Results of BASIS Achievement Testing for Deborah

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	80	13	113	83	94	29	123	92
Reading	32	16	93	85	56	32	102	93
Spelling	13	28	83	91	32	46	93	98

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

Relationships

Table 4 is a summary of percentages of time for each ratio in seven active academic responses, attending, and the composites for active responding time, academic engaged time, management time, and inappropriate behavior time. Figure 1 is a representation of the ART and attending (which together comprise AET), as well as management and inappropriate responses made by Deborah during each STR. Deborah was academically engaged (AET) an average of 91.9% of the time across both STR's (range = 91.7 - 92.2). Yet, ART was 58.4% in 1:1 and only 16.7% in 2:1. Management and inappropriate behaviors accounted for 7.8% of the 1:1 ratio time and 8.3% of the time spent in the 2:1 ratio.

In the 2:1 ratio, Deborah's academic engaged time was 91.7% of the total time. The primary activity was spelling. Only reading aloud (4.2%) and answering academic questions (12.5%) were active responses. Seventy-five percent of the time in the 2:1 ratio was passive attending. In the 1:1 ratio, Deborah's active engaged time (AET) was 92.2% of the total time. The primary activity was math. Nearly 34% of this time was passive attending. A breakdown of the active responding time (see Table 4) indicates that Deborah spent the greatest proportions of time either talking appropriately (27.7%) or playing an academic game (13.8%). Passive attending time accounted for only 34% of total time in the 1:1 ratio.

The methods of instruction form indicated some differences between the two student-teacher ratios. For math in the 1:1 ratio, a direct instruction method was used. This method is represented by passive attending and talking appropriately on the CISSAR codes. Answering academic questions was not coded as often as might be expected in this situation. Reading/spelling flashcards

Table 4

Deborah's Responses During Different Student-Teacher Ratios in Special Education

	Ratio[b]	
	MATH	SPELLING/READING
Response[a]	1:1	2:1
Writing	7.7	--
Playing game	13.8	--
Reading aloud	1.5	4.2
Reading silently	--	--
Talking appropriately	27.7	--
Answering question	7.7	12.5
Asking question	--	--
ART	58.4	16.7
Attending	33.8	75.0
AET	92.2	91.7
MGMT	1.5	--
INAPP	6.2	8.3

[a]Separate academic responses and composites active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP) are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 11 minutes in 1:1 and 4 minutes in 2:1.

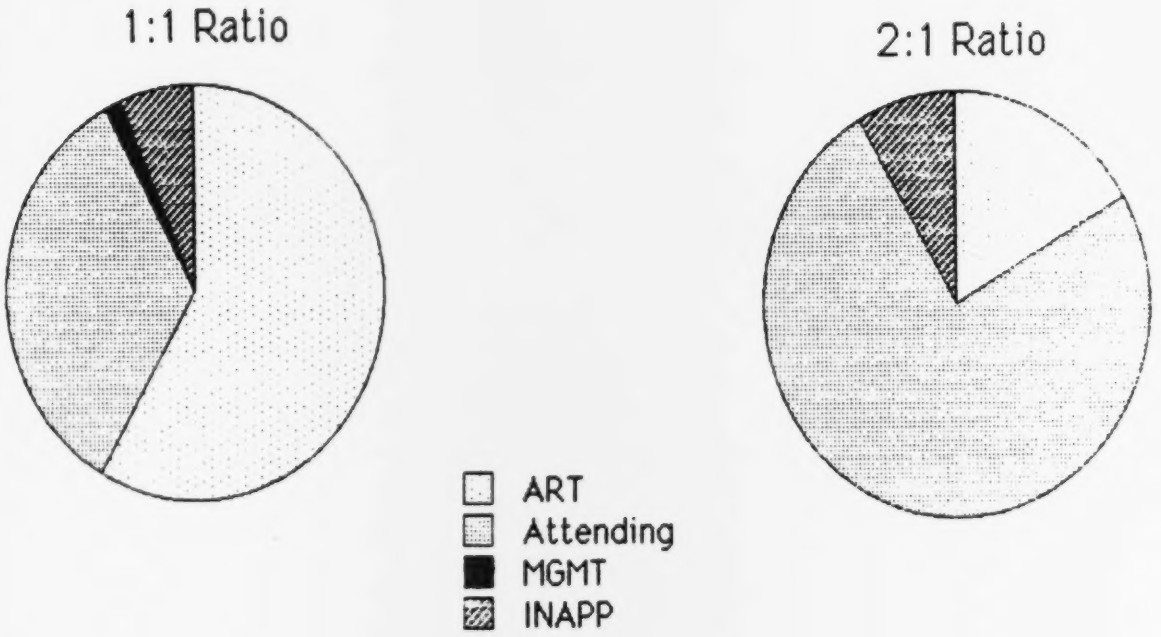

Figure 1. Deborah's Responses During 1:1 and 2:1 Ratios

were used in the 2:1 ratio for testing purposes. "Testing" on the methods of instruction form corresponds primarily to passive attending and answering academic questions on CISSAR when flashcards are used. Deborah was passively attending six times as often as she was actively engaged in the 2:1 ratio.

Summary

Deborah was observed in the special education setting in 1:1 and 2:1 STRs. AET was consistent between settings, but ART was significantly higher in the 1:1 ratio (58.4%) than in the 2:1 ratio (16.7%). The primary activity in the 1:1 ratio was direct instruction in mathematics; in the 2:1 ratio, flashcard testing in spelling was the primary activity. In terms of achievement, Deborah's performance declined considerably in math and reading on both grade-referenced and age-referenced scores. CBM data, in contrast, reveal positive growth in reading performance scores. Deborah showed positive gains in spelling achievement over the time period of the investigation. The overall description of student performance and behavior is quite variable. Deborah seems to be an unmotivated student who is not achieving in school in a way that meets the expectations of her parents and teachers.

CASE #2: Maureen

The Student

Maureen is a 9-year-old, white, female, third grader in a suburban elementary school. She is classified as learning disabled. On the WISC-R, she received a verbal IQ of 98, a performance IQ of 91 and a full scale IQ of 94. On the BRP, both regular and special education teachers did not rate her as a behavior problem. She did not rate herself as a behavior problem and neither did her parents.

On the CLES, ratings of the home, school, and instruction were all very high. The only exception was Maureen's low rating of her own attitude toward school and learning.

The Special Education Setting

Maureen was observed in three different ratios in her special education classroom: 2:1, 7:2, and 6:1. The scheduled time for instruction was 45 minutes. The actual instruction time was 46 minutes.

Achievement

Maureen's achievement in math, reading, and spelling was measured using the BASIS in both the spring of 1986 and the spring of 1987. CBM reading data also were collected at both of these testing sessions.

Maureen's percentile ranks and standard scores during these testing sessions are shown in Table 5. During the year of investigation, Maureen showed a decrease in math skills from being well above average to being slightly below average (SS 116 to 95, PR 85 to 36). An increase in reading scores was noted on both the BASIS (SS 88 to 105, PR 21 to 63) and on the CBM data, where the number of words read correctly increased from 17 to 46 with only a slight increase in the number of errors (from 9 to 11). A decrease in her spelling score also was noted (SS 88 to 72, PR 21 to 3).

Relationships

During the time that Maureen was observed in the 2:1 ratio (approximately 16 minutes), she was involved in reading for 95.2% of the time. All of the time in the 7:2 ratio (approximately 16 minutes) was spent in free time. In the 6:1 ratio (approximately 14 minutes), 100% of the time was spent on social skills instruction. The percentage of time that Maureen spent in each response while in each ratio is shown in Table 6 and depicted graphically in Figure 2.

Table 5

Results of BASIS Achievement Testing for Maureen

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	85	36	116	95	68	29	107	92
Reading	21	63	88	105	15	50	84	100
Spelling	21	3	88	72	16	3	85	72

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

Table 6

Maureen's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING 2:1	FREETIME 7:2	SOCIAL SKILLS 6:1
Writing	17.5	--	--
Playing game	--	--	3.8
Reading aloud	4.9	--	1.9
Reading silently	17.5	--	--
Talking appropriately	3.2	18.3	15.1
Answering question	12.7	--	5.7
Asking question	6.3	--	--
ART	62.1	18.3	26.5
Attending	22.2	28.3	49.1
AET	84.3	46.6	75.6
MGMT	11.0	53.4	24.4
INAPP	4.7	--	--

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 10.5 minutes in 2:1, 10.0 minutes in 7:2, and 8.8 minutes in 6:1.

Figure 2. Maureen's Responses During 2:1, 7:2, and 6:1 Ratios

In the 2:1 ratio in reading, Maureen responded in a variety of ways. She was actively responding 62.1% of the time and actively engaged 84.3% of the time. While in reading, 18 problems were attempted and completed. All 18 problems were answered correctly. In the 7:2 ratio during free time, she was actively responding only 18.3% and engaged only 46.6%. The remaining 53.4% of the time was spent in management responses.

In the 6:1 ratio (social skills), Maureen was actively responding 26.5% of the time and actively engaged 75.2% of the time. The remaining 24.4% of the time was spent in management responses.

The method of instruction also was observed for the 2:1 and 6:1 ratios. While in the 2:1 ratio in reading, the teacher used teacher demonstration, student demonstration, seatwork for 2 minutes, discussion for 1 minute, and independent work for 5.5 minutes. While in the 6:1 ratio, the teacher used independent work for 2 minutes.

Summary

In the 2:1 ratio (primarily reading) Maureen spent a greater percentage of time in ART, AET, and a small percentage of time in management responses than in the 7:2 (free time) or 6:1 (social skills) ratios. In both the 7:2 and 6:1 ratios, a greater percentage of time was spent attending than in the 2:1 ratio. Only about one-third of Maureen's special education time was allocated to an academic subject - reading, the one content area in which her achievement scores increased over the year. These increases occurred for a student who had average intelligence and was not a behavior problem. Yet, Maureen's scores in math and spelling decreased over the same time period.

CASE #3: Craig

The Student

Craig is an 11-year-old, Hispanic, male, third grader. He attends an urban school and is classified as learning disabled. It was noted that Craig was very resistant, uncooperative, and unmotivated during the intelligence testing session; results were not thought to be valid estimates of his abilities. On the BRP, Craig was described by his teacher as not being a behavior problem. However, his parents did rate him as having several problem behaviors at home, such as being verbally aggressive, complaining, and not following directions. Craig, however, does not view himself as a behavior problem.

On the CLES questionnaire, Craig was rated as not appreciating the value of hard work in education, although his attitude toward school and the rationale for hard work in school were rated as positive. Parent ratings indicated that tne home was positive and supportive. Teachers gave high ratings to both the administration and the instruction. School was viewed as being able to make a difference for its students.

The Special Education Setting

Craig was in two different student-teacher ratios in his special education classroom on the day he was observed (3:1 and 8:1). The scheduled time for instruction was 60 minutes; actual instructional time was 49 minutes. Of this time, 62.9% was in a 3:1 ratio in math and spelling, and 37.1% was in an 8:1 ratio in reading and spelling.

Achievement

Craig's achievement in math, reading, and spelling were measured using the BASIS in both the spring of 1986 and the spring of 1987. CBM reading data also

were collected at both of these testing sessions. Craig's percentile ranks and standard scores during these testing sessions are listed in Table 7. During the year of investigation, Craig showed an increase in math scores (SS 74 to 95, PR 4 to 36), a slight decrease in spelling scores (SS 77 to 72, PR 6 to 3) and a slight decrease in reading scores (SS 72 to 69, PR 3 to 2). On CBM, Craig increased the number of words read correctly from 3 to 14, but also increased the number of errors from 7 to 12.

Relationships

During the approximately 31 minutes of observation in the 3:1 ratio, Craig participated in math for 14% of the time, spelling for 74% of the time, and transition for the remaining 12% of the time. During the approximately 18 minutes in the 8:1 ratio, he participated in reading for 62% of the time, spelling for 35% and transition for 3% of the time. Table 8 shows the percentage of time that Craig spent in each response while in each ratio. Figure 3 is a depiction of the percentages of time in each response composite.

While in the 3:1 ratio, Craig was actively responding 42.4% of the time; in the 8:1 ratio, he was actively responding only 24.7% of the time. Craig was actively engaged 63.6% of the time while in the 3:1 ratio and 61.7% of the time while in the 8:1 ratio. In the 3:1 ratio, inappropriate behaviors comprised 14.5% of the time, while they comprised 24.7% of the time while in the 8:1 ratio. Also, while in the 3:1 ratio, management behaviors were observed 22.1% of the time; while in the 8:1 ratio, management behaviors comprised only 13.7% of the time.

Task success and completion rates also were gathered. In math, Craig was assigned 15 tasks, completed all 15, and was correct on 12 of the tasks. In

Table 7

Results of BASIS Achievement Testing for Craig

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	4	36	74	95	1	5	65	75
Reading	3	2	72	69	1	1	65	65
Spelling	6	3	77	72	1	1	65	65

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

Table 8

Craig's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] MATH/SPELLING 3:1	Ratio[b] READING/SPELLING 8:1
Writing	23.1	9.6
Playing game	--	1.4
Reading aloud	--	5.5
Reading silently	10.6	--
Talking appropriately	7.7	4.1
Answering question	1.0	4.1
Asking question	--	--
ART	42.4	24.7
Attending	21.2	37.0
AET	63.6	61.7
MGMT	22.1	13.7
INAPP	14.5	24.7

[a]Separate academic responses and composites active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP) are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 17.5 minutes in 3:1 and 11.3 minutes in 8:1.

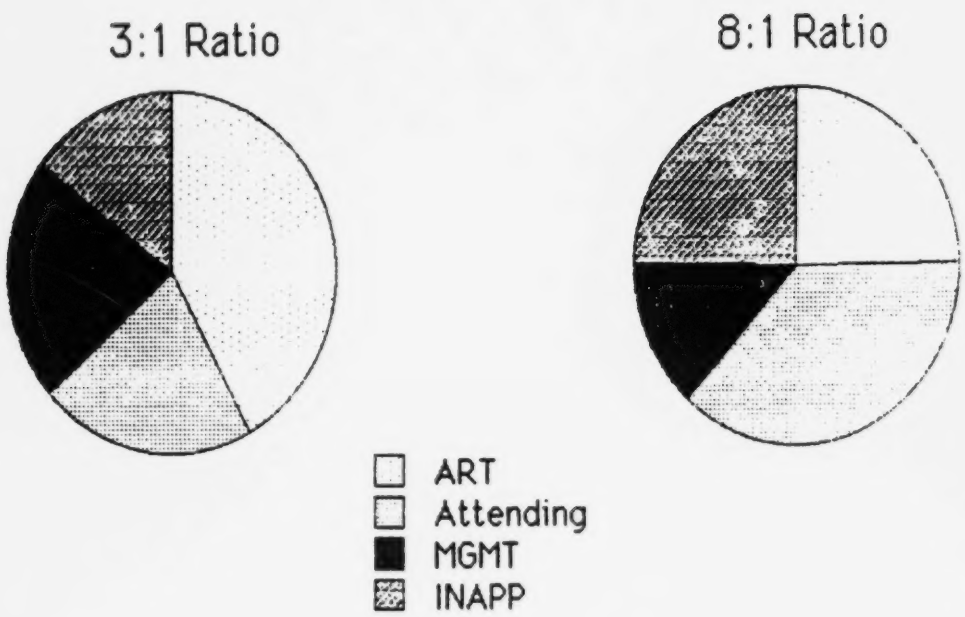

Figure 3. Craig's Responses During 3:1 and 8:1 Ratios

spelling, 26 tasks were assigned, all 26 were completed correctly. In reading, 24 tasks were assigned and, again, all 24 were completed correctly.

Overall, Craig spent more time actively responding, less time in inappropriate behaviors, but more time in management behaviors in the 3:1 ratio tnan in the 8:1 ratio. However, the amounts of academic engaged time were approximately equal: 63.6% in 3:1 and 61.7% in 8:1.

The methods of instruction also were recorded while Craig was in each ratio. In the 3:1 ratio, the teacher used the teacher demonstration, student demonstration, seatwork method for 3 minutes and independent seatwork for 12 minutes. In the 8:1 ratio, the teacher used direct instruction for 2 minutes, teacher demonstration, student demonstration, seatwork for 6 minutes, and independent work for 3 minutes.

Summary

Craig spent a greater percentage of time in ART in the 3:1 ratio than he did in the 8:1 ratio. Approximately equal proportions of time were spent in AET in both ratios. However, a greater percentage of time was spent in appropriate responding and less time in management responding in 8:1 than in the 3:1 ratio. It is noteworthy that achievement gains were made only in math, the area in whicn the student received instruction in a 3:1 ratio. A decrease in achievement occurred in math, which was taught in a 8:1 ratio.

CASE #4: Jim

The Student

Jim is an 11-year-old, white, male, third grader classified as educable mentally handicapped. He attends a suburban elementary school. Based on the

WISC-R, his verbal IQ is 72, his performance IQ is 45, and his full scale IQ is 55. On the BRP, Jim was described by both parents, his teacher, and himself as not being a behavior problem.

His teacher rated him as somewhat of a loner, being avoided by other students. He also was rated as argumentative, but this was not viewed as a problem by the parents at home. On the CLES questionnare, Jim showed a positive attitude toward school, and the home was seen as supportive of the school's efforts. It also was indicated that a rationale was provided for the work in school, that it was believed the school could make a difference for the student, that there is strong administrative leadership in the school, and that the teacher was both task oriented and humanistic.

The Special Education Setting

Jim was observed in two student-teacher ratios in his special education classroom, in a 7:1 ratio and in a 9:1 ratio. The scheduled time for instruction was 50 minutes; the actual instructional time on the day of observation was 53 minutes. Of this time, approximately 62% (33 minutes) was in the 7:1 ratio (97.7% in reading) and 38% (20 minutes) in the 9:1 ratio (95.1% in reading).

Achievement

Jim's achievement in math, reading, and spelling was measured using the BASIS in both the spring of 1986 and the spring of 1987; CBM reading measures also were used at these times. The percentile ranks and standard scores obtained by Jim during these testing sessions are shown in Table 9. During the year of investigation, Jim showed a slight decrease in math scores (SS 69 to 65, PR 2 to 1). However, there were large gains in reading, as shown by scores on

Table 9

Results of BASIS Achievement Testing for Jim

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	2	1	69	65	1	1	65	65
Reading	2	22	69	88	1	8	65	79
Spelling	21	17	88	86	5	6	75	77

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

both tne BASIS (SS 69 to 88, PR 2 to 22) and the CBM common passage (number of words read correctly increased from 5 to 25, with a decrease in errors from 6 to 3). A slight decrease in spelling was also evident (SS 88 to 86, PR 21 to 17).

Relationships

During the CISSAR observations in both 7:1 and 9:1 ratios, Jim was observed while participating in reading class. The percentages of time that Jim spent in each response while in each ratio are shown in Table 10; composite response percentages are shown in Figure 4. While in reading in the 7:1 ratio, Jim was actively responding 54.6% of the time; in the 9:1 ratio, he was actively responding 43.8% of the time. Jim was actively engaged 93.2% of his time in the 7:1 ratio, but only 71.8% of his time in the 9:1 ratio.

While in the 7:1 ratio, Jim spent 22.0% of his time reading aloud, while he spent no time reading aloud in the 9:1 ratio. However, he did spend 39.0% of his time in the 9:1 ratio reading silently, while spending only 1.5% of his time reading silently in the 7:1 ratio. While in the 7:1 ratio, 2.3% of his time was spent in inappropriate behaviors; in the 9:1 ratio, his time responding inappropriately was over six times as much (14.7%). Also, in the 7:1 ratio, 4.6% of the time was spent in management behaviors while 13.4% of the time was spent in management behaviors in the 9:1 ratio.

The method of instruction also was observed while Jim was in each ratio. In the 7:1 ratio, the teacher used the discovery-inquiry method for 2 minutes, and the teacher demonstration, student demonstration, seatwork method for 16.67 minutes. In the 9:1 ratio, the teacher demonstration, student demonstration, seatwork method was used for 9.67 minutes, while independent seatwork was used for 4 minutes.

Table 10

Jim's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING 7:1	READING 9:1
Writing	2.3	2.4
Playing game	--	--
Reading aloud	22.0	--
Reading silently	1.5	39.0
Talking appropriately	9.1	--
Answering question	19.7	1.2
Asking question	--	1.2
ART	54.6	43.8
Attending	38.6	28.0
AET	93.2	71.8
MGMT	4.6	13.4
INAPP	2.2	14.8

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 22.2 minutes in 7:1 and 13.7 minutes in 9:1.

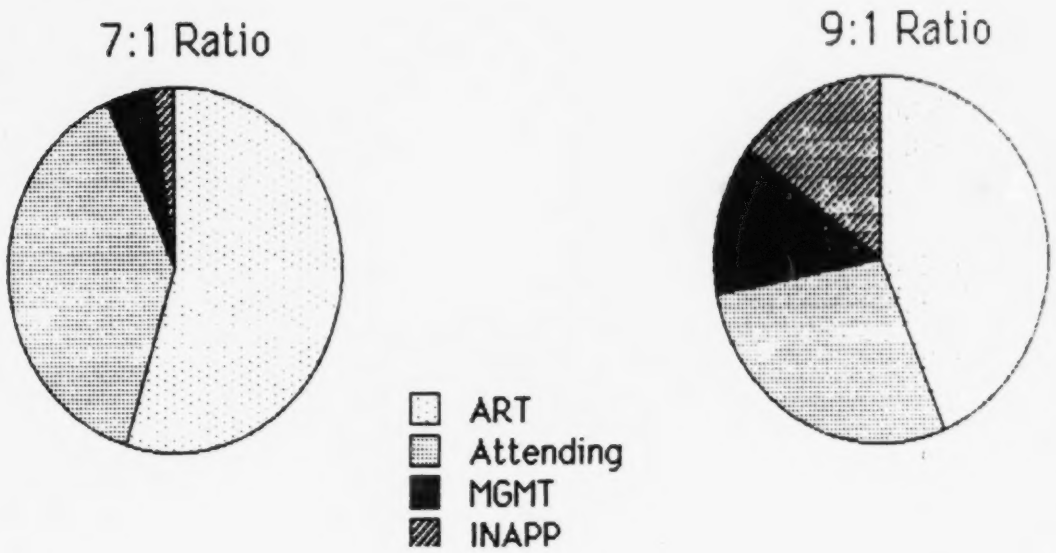

Figure 4. Jim's Responses During 7:1 and 9:1 Ratios

Summary

Overall, Jim spent a greater percentage time reading aloud, actively responding, actively engaged while in the 7:1 ratio than in the 9:1 ratio. A smaller percentage of time was spent in the 7:1 ratio in management and inappropriate bahaviors than in the 9:1 ratio. However, in the 9:1 ratio, Jim spent more time reading silently than in the 7:1 ratio. Increases in achievement occurred for Jim only in reading.

CASE #5: Jill

The Student

Jill is a white, female, 10-year-old student in an urban elementary school. She is in the fourth grade and receives services in both regular and special education settings. She is classified as an EMR student. Her full scale IQ on the WISC-R is 97 (verbal IQ = 98; performance IQ = 96). The BRP was completed by the regular and special education teachers, the student's mother, and by Jill. Jill is described by both teachers as an underachiever. Behaviorally, she is described as a normal child who evidences frustration with schoolwork (e.g., daydreaming, failing to stay on task). Jill's mother also describes her as a relatively normal child, who nonetheless is not likely to take leadership roles in peer situations. On self measures of the BRP, Jill describes herself as shy and introverted in peer relationships, and as having difficulty attending to the teacher and concentrating on schoolwork.

The CLES questionnaire was used to measure the current educational environment of the student. Ratings showed very supportive home and community characteristics. Administrative leadership in the school and a rationale for

working hard in school, however, are considered to be lacking in the student's current environment. Ratings of "not much like the student's environment" included: (a) appreciation of the value of hard work and education; (b) high moral standards and values fostered in the home; and (c) positive attitude toward school and learning.

Tne Special Education Setting

Jill was scheduled for reading instruction in the resource room for a period of one hour. She received instruction in 3:1 (35%) and 4:1 (65%) student-teacher ratios for a total of 54 minutes. In the 3:1 ratio, 96% of the time was coded as reading (approximately 18 minutes), and 4% was coded as transition (approximately 1 minute). In the 4:1 ratio, 73% of the time was spent in reading (approximately 26 minutes) and 27% in spelling (approximately 9 minutes). All instruction took place in entire group arrangements.

Achievement

Jill's achievement in math and reading was measured on the BASIS (see Table 11). During the year, Jill showed negative change in grade-referenced scores for math (standard scores 95 to 82; percentile ranks 36 to 12). Grade referenced scores for reading also showed a decline during that time period (standard scores 90 to 74; percentile ranks 25 to 4). Age-referenced scores for math showed minimal positive change (standard scores 92 to 93; percentile ranks 29 to 30). Reading age-referenced scores showed negative change (standard scores 87 to 79; percentile ranks 20 to 8). Curriculum-based measures on a standard reading passage showed an increase of 43 words read correctly per one minute sample (60 to 111).

Table 11

Results of BASIS Achievement Testing for Jill

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	36	12	95	82	29	31	92	93
Reading	25	4	90	74	20	8	87	79
Spelling	2	1	69	65	2	2	69	69

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

Measures of task completion could be obtained only for spelling exercises. Jill attempted two timed spelling tests; the first one consisted of 17 words, the second of 14 words. Jill correctly spelled 5 words on test 1 and zero words on test 2.

Relationships

Jill was academically engaged an average of 90.7% of the time across both ratios. Academic responding time averaged 57.0% across ratios. Management behaviors accounted for 18.2% of the 3:1 ratio time, but only 3.3% of the time in the 4:1 ratio. As shown in Table 12 and Figure 5, Jill was actively engaged and actively responding considerably more in the 4:1 ratio than in the 3:1 ratio.

In the 4:1 ratio (which included both reading and spelling) the student was engaged 96.2% of the time; 27.8% was passive attending and 68.4% active academic responding. A breakdown of the ART shows three dominant behaviors in the 4:1 ratio: writing (17.8%), reading aloud (18.3%), and reading silently (31.1%). In the 3:1 ratio, consisting nearly entirely of reading instruction, Jill was engaged 80.3% of the time; 44.8% was passive attending, and 35.5% was active responding. Playing an academic game comprised nearly half of the ART (14.6%). The large proportions of passive attending and management behaviors significantly reduced the amount of time available for active responses.

Records on the Methods of Instruction form indicated that in Jill's reading instruction in the 3:1 and 4:1 ratios, practice/drill and discussion primarily were used. Within these methods, Jill was reading aloud, reading silently, and passively attending. When spelling was observed in the 4:1 ratio, the observed instructional methods were testing and correcting papers. During these times,

Table 12

Jill's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING 3:1	READING/SPELLING 4:1
Writing	2.1	17.8
Playing game	14.6	--
Reading aloud	1.0	18.3
Reading silently	4.2	31.1
Talking appropriately	6.3	.6
Answering question	5.2	.6
Asking question	2.1	--
ART	35.5	68.4
Attending	44.8	27.8
AET	80.3	96.2
MGMT	18.2	3.3
INAPP	1.0	.6

[a]Separate academic responses and composites active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP) are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 15 minutes in 3:1 and 30 minutes in 4:1.

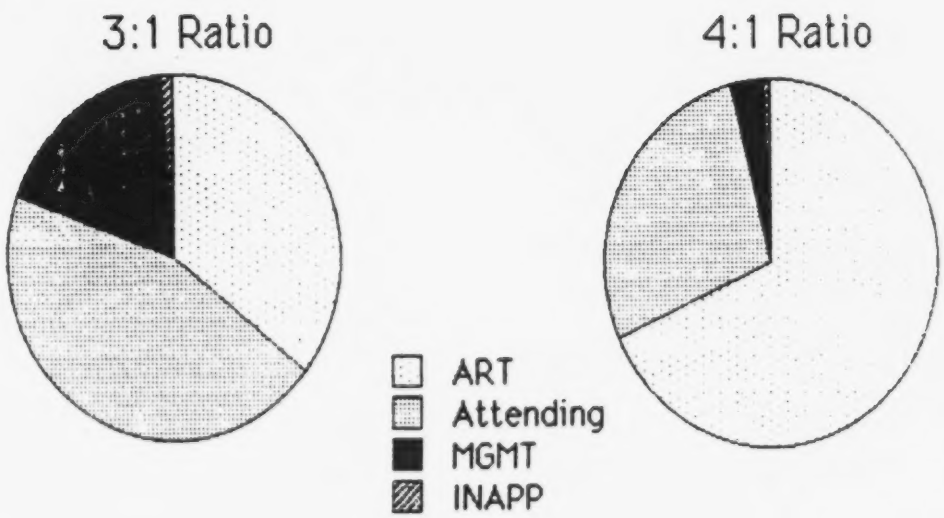

Figure 5. Jill's Responses During 3:1 and 4:1 Ratios

Jill was primarily passively attending and writing. During the practice/drill and testing methods, Jill's active responding time was substantially higher.

Summary

For reading instruction, Jill was in 3:1 and 4:1 student-teacher ratios. She also received some instruction in spelling in the 4:1 ratio. There was a higher percentage of AET and ART in the 4:1 ratio, with most reading instruction comprised of reading aloud or reading silently in a practice/drill method. Passive attending accounted for over one-half of the instructional time in the 3:1 ratio. Jill's achievement levels in reading, as measured by the norm-referenced BASIS, declined over the period of the investigation. CBM measures of reading ability showed positive growth. There was no significant change in math achievement test scores.

Case #6: Paul

The Student

Paul is a 10-year-old white, male, fifth grader classified as learning disabled in a suburban school. He had a verbal IQ score of 119, a performance IQ of 123, and a full scale IQ of 123. On the BRP, both the special education teacher and mother rated Paul as not being a behavior problem. The regular education teacher did not rate him as a behavior problem, yet stated that he was an underachiever who did not follow directions, was overactive and restless, could not concentrate, did not do homework, and daydreamed. The student did not rate himself as being a behavior problem.

All questions on the CLES were rated extremely positive, all receiving ratings of 4 with the exception of one rating of 3. The school, home, community, and instruction all received high ratings.

The Special Education Setting

Paul was observed in a 1:1 ratio and in a 2:1 ratio. The scheduled time for instruction was 30 minutes, while the actual instructional time was 31 minutes. Of this time, 91% (approximately 28 minutes) was spent in a 1:1 ratio in reading and spelling; 9% (approximately 3 minutes) was spent in a 2:1 ratio in business management.

Achievement

Paul's achievement in math, reading, and spelling was measured using the BASIS in the spring of both 1986 and 1987. CBM reading data also were gathered during each of these testing sessions. Percentile ranks and standard scores obtained by Paul during these testing sessions are shown in Table 13. During the year of investigation, Paul showed a decrease in math scores for his grade (SS 122 to 116, PR 93 to 85), but an increase in reading scores on both the BASIS (SS 79 to 91, PR 8 to 27), and the reading CBM (number of words read correctly increased from 62 to 84 and number of errors decreased from 5 to 2). His spelling scores stayed relatively unchanged (SS 93 to 92, PR 32 to 30).

Relationships

During the 19.33 minutes of observation in the 1:1 ratio, Paul participated in reading for 42.2% of the time and spelling for 56.9% of the time. In the 2:1 ratio, 100% of the 2 minutes were spent in Business Management. The percentages of time that Paul spent in each response while in each ratio are shown in Table 14. A depiction of composite response percentages is in Figure 6. In reading, 10 tasks were assigned. All 10 were completed, 9 correctly. The method of instruction was also observed while Paul was in each ratio. In the 1:1 ratio, his teacher used the teacher demonstration, student demonstration, seatwork

Table 13

Results of BASIS Achievement Testing for Paul

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	93	85	122	116	98	81	131	113
Reading	8	27	79	91	18	30	86	92
Spelling	82	30	93	92	44	29	98	92

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

Table 14

Paul's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING/SPELLING 1:1	BUSINESS MANAGEMENT 2:1
Writing	23.3	--
Playing game	--	--
Reading aloud	24.1	--
Reading silently	4.3	--
Talking appropriately	19.0	33.3
Answering question	16.4	--
Asking question	.9	8.3
ART	88.0	41.6
Attending	11.2	25.0
AET	99.2	66.6
MGMT	.8	33.4
INAPP	--	--

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 19.3 minutes in 1:1 and 2.0 minutes in 2:1.

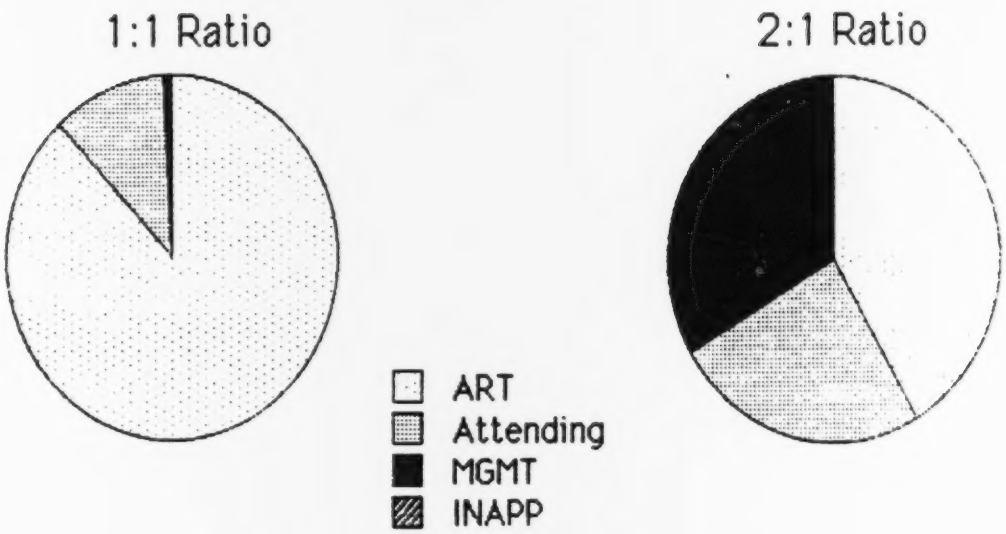

Figure 6. Paul's Responses During 1:1 and 2:1 Ratios

method for 1 minute, discussion for 11.17 minutes, independent work for 1 minute, and testing for 3 minutes. While in the 2:1 ratio, practice/drill was used for 2 minutes.

Summary

Paul was a student with above average intelligence. Essentially, he received all his instruction in a 1:1 ratio, and the focus of instruction was reading and spelling. Reading was the one area in which achievement gains were noted.

CASE #7: Joseph

The Student

Joseph is a black, male, 11-year-old fifth grade student in an urban elementary school. He is classified as an LD student and receives instruction in both regular and special education settings. His full scale IQ on the WISC-R is 89 (verbal IQ = 81; performance IQ = 100). He is described by both his regular and special education teachers on the BRP as an unmotivated student who displays some immature, attention-getting behaviors (e.g., tattling on peers). Overall ratings by both teachers, however, and normative comparisons are within normal limits. Parent ratings on the BRP are consistent with teacher ratings. The parents report tattling as well as other "egocentric" behavior by the student. Joseph's self reports on the BRP are significantly below the average on home and school ratings. He reports a strong disliking for school and his teachers. Self reports of peer relationships are slightly below the norm. He also reports having many friends, consistent with the teacher and parent ratings. The CLES questionnaire was used to measure the current educational

environment of the student, and gives a strongly positive description of the student's home, school, and community. All three are viewed as supportive, and Joseph's attitude toward school and learning is considered generally favorable.

The Special Education Setting

Joseph was scheduled to receive resource room instruction in reading for one hour. He received instruction for 48 minutes on the day of observation. In the resource room. Joseph was involved in student-teacher ratios of 8:1 (33%) and 9:1 (67%) for reading instruction. In the 8:1 ratio, 85% of the time was coded as reading and 15% as business management activities. In the 9:1 ratio, 98% was coded as reading and 2% as transition activities. Grouping arrangements in the special education setting included small group instruction for the 8:1 ratio, and entire group, small group, and individual arrangements during the 9:1 ratio time.

Achievement

Joseph's achievement in math and reading was measured on the BASIS. Table 15 is a summary of Joseph's percentile ranks and standard scores for the tests given in the spring of 1986 and the spring of 1987. Across the two testings, Joseph demonstrated positive growth on grade-referenced scores in math (SS 78 to 86; PR 7 to 17). Age-referenced scores for math achievement also showed positive gains (SS 82 to 87; PR 12 to 20). Reading grade and age scores on the BASIS did not change from 1986 to 1987, and spelling achievement dropped slightly. Curriculum-based measures on a standard reading passage showed an increase of 37 words read correctly per one minute sample (48 to 85) over the year of the investigation.

Table 15

Results of BASIS Achievement Testing for Joseph

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	7	17	78	86	12	20	82	87
Reading	4	4	74	74	6	6	77	77
Spelling	6	2	77	69	11	3	82	72

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

On measures of task completion and success rate in the special education setting, Joseph attempted three worksheets of 15 items each. Two of these were spelling tests and one an exercise on alphabetizing words. Joseph obtained perfect scores on both spelling papers and 14 of 15 correct on the alphabetizing task. Joseph also was asked to read orally for one minute, attempting 49 words and correctly reading 45 words.

Relationships

Joseph was academically engaged an average of 88.4% of the time across both student-teacher ratios (see Table 16). He was actively responding an average of 64.4% of the time across ratios. Management behaviors comprised 10.6% of the 8:1 ratio time and 10.7% of the 9:1 ratio time. Both ratios were fairly consistent in proportions of time accounting for AET, ART, and management behaviors.

In the 8:1 ratio, approximately 13.5 minutes were coded as reading instruction. Joseph's AET was 89.4% of this time: 57.6% active responding and 31.8% passive attending (see Figure 7). The ART breaks down into the following behaviors: writing (15.2%), reading aloud (26.7%), reading silently (24.2%), and asking academic questions (1.5%).

In the 9:1 ratio, approximately 32.0 minutes were devoted to reading. Joseph's AET was 88.1% of this time: 67.3% active responding, and 20.8% passive attending (see Figure 7). The ART of this ratio is comprised of four primary student responses: writing (27.7%), reading aloud (7.5%), reading silently (17.0%), and answering academic questions (9.4%). Again, there is general consistency in the composition of the academic time in both the 8:1 and 9:1 ratios.

Table 16

Josepn's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING 8:1	READING 9:1
Writing	15.2	27.7
Playing game	--	3.1
Reading aloud	16.7	7.5
Reading silently	24.2	17.0
Talking appropriately	--	1.3
Answering question	--	9.4
Asking question	1.5	1.3
ART	57.6	67.3
Attending	31.8	20.8
AET	89.4	88.1
MGMT	10.6	10.7
INAPP	--	1.3

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 11.0 minutes in 8:1 and 26.5 minutes in 9:1.

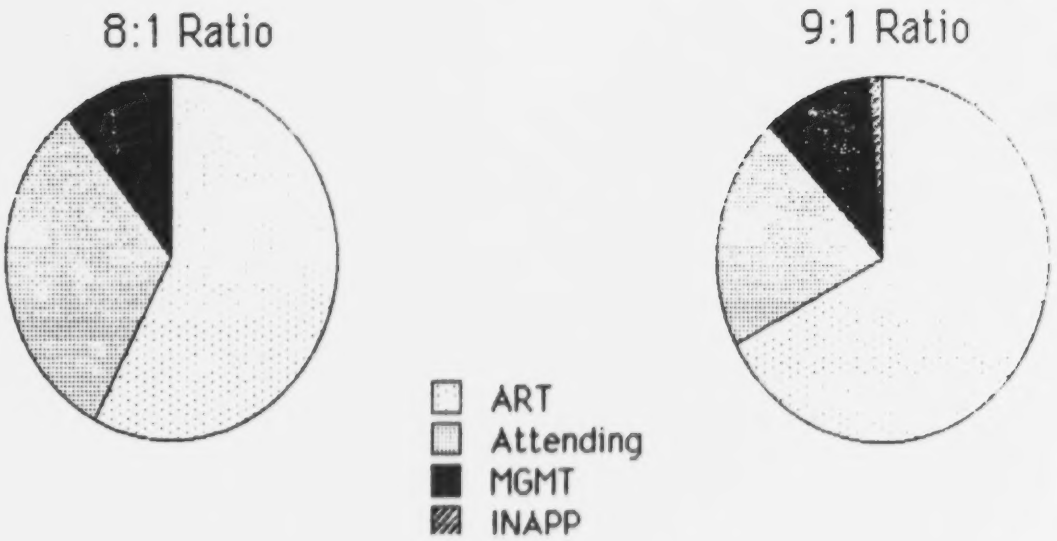

Figure 7. Joseph's Responses During 8:1 and 9:1 Ratios

Summary

Joseph was observed in the special education resource room setting for reading instruction in 8:1 and 9:1 ratios. Academic engaged time and academic responding times were similar in both ratios. Writing and reading aloud and silently were the primary student responses observed. With respect to achievement on norm-referenced measures of reading, however, Joseph showed no gains. Curriculum-based measures of reading indicated positive gains. Joseph did make achievement gains in math on the BASIS; math instruction was received in the mainstream setting.

CASE #8: Silvia

Tne Student

Silvia is an 11-year-old, fifth grade girl who is classified as educable mentally retarded and receives special education services in the resource room for approximately one hour per day. Reading and math are designated in her IEP. Silvia is a Native American in an urban school district. Test data indicate below average intelligence (WISC-R full scale = 83; verbal = 77; performance = 92). Scores on the Behavior Rating Profile indicate few behavior difficulties perceived by parents or the regular education teacher. The special education teacher provided ratings indicative of somewhat greater difficulties. Silvia nerself perceives difficulties with peers; the school environment is more troublesome for Silvia than is the home environment.

The home learning environment for Silvia was seen as very supportive of school efforts, as providing the child with a rationale for working hard in school, and as one that fostered high standards and values. The principal

characterized the community in which Silvia lived as also being very supportive of school efforts. Ratings indicated that Silvia somewhat appreciated the value of hard work and education, and had a fairly positive attitude toward school and learning. It was noted, however, that Silvia did not usually have a rationale for working hard in school. The administrative leadership in Silvia's school was characterized as fairly strong, and the special education learning environment was very positively characterized on dimensions of providing a rationale for hard work, having a task-oriented and humanistic teaching style, and believing strongly that the school makes a difference for its students.

The Special Education Setting

Silvia was scheduled to receive special education instruction in reading and math for a total of approximately one hour per day. When observed, actual allocated time was 55 minutes. During her special education time, Silvia was in ratios of two students to one teacher (2:1), three students to one teacher (3:1), and four students to one teacher (4:1). Most of the time (approximately 29 minutes), the student was in a 3:1 ratio; about 10 minutes of this ratio was devoted to reading and about 10 minutes to spelling. Another 8 minutes was devoted to math and another minute to transition. The student was in the 4:1 ratio for approximately 21 minutes; all of this time was devoted to either reading (15 minutes) or spelling (6 minutes). The 2:1 ratio time (about 5 minutes) was split among reading (2 minutes), spelling (1 minute) and math (2 minutes).

Achievement

BASIS percentile ranks (PR) and standard scores (SS) for grade and age norms are shown in Table 17. Scores in both math and spelling decreased over

Table 17

Results of BASIS Achievement Testing for Silvia

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	6	2	77	69	5	2	75	69
Reading	3	10	72	81	2	10	69	81
Spelling	3	1	72	65	2	1	69	65

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

the one year period from spring 1986 to spring 1987. In contrast, reading scores increased significantly. The number of words read correctly on a common reading passage increased during the year's time by a factor of more than three, from 36 to 115, with errors decreasing at the same time (from 4 to 1). On measures of task completion and task success during the observation, Silvia attempted all items on the one task that could be assessed, which involved a two-minute timed math test (25 of 25). The student's success rate on the test was 100%. However, when Silvia was asked how well she understood the assignment, she rated it toward the lower end, and when asked how much she believed she could do the assignment, she again rated toward the lower end of the scale. On interest in the assignment and wanting to do the assignment, she indicated the top rating of "very much."

Relationships

The types of responses made by Silvia in the 2:1, 3:1 and 4:1 ratios are shown in Table 18 (see also Figure 8). Academic engaged time (AET) in the three ratios was quite similar; all were above 90%. In contrast, there was considerable variability in active academic responding time (ART) across the three ratios, with the lowest percentage in the 2:1 ratio (29%) and the highest percentage in the 3:1 ratio (69%). The differences in Silvia's ART in the three ratios are directly related, for the most part, to differences in attending time. The higher the percentage of attending responses, the lower the percentage of ART responses. Silvia's management responses accounted for very little of the time she was in the special education setting; no inappropriate responses were observed.

Table 18

Silvia's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING/MATH/ SPELLING 2:1	READING/ SPELLING 3:1	READING/ SPELLING 4:1
Writing	--	23.1	3.8
Playing game	--	--	2.5
Reading aloud	23.5	4.6	12.5
Reading silently	5.9	33.3	30.0
Talking appropriately	--	3.7	2.5
Answering question	--	2.8	6.3
Asking question	--	1.9	--
ART	29.4	69.4	57.6
Attending	64.7	22.2	38.8
AET	94.1	91.6	96.4
MGMT	5.9	8.4	3.8
INAPP	--	--	--

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 5 minutes in 2:1, 29 minutes in 3:1, and 21 minutes in 4:1.

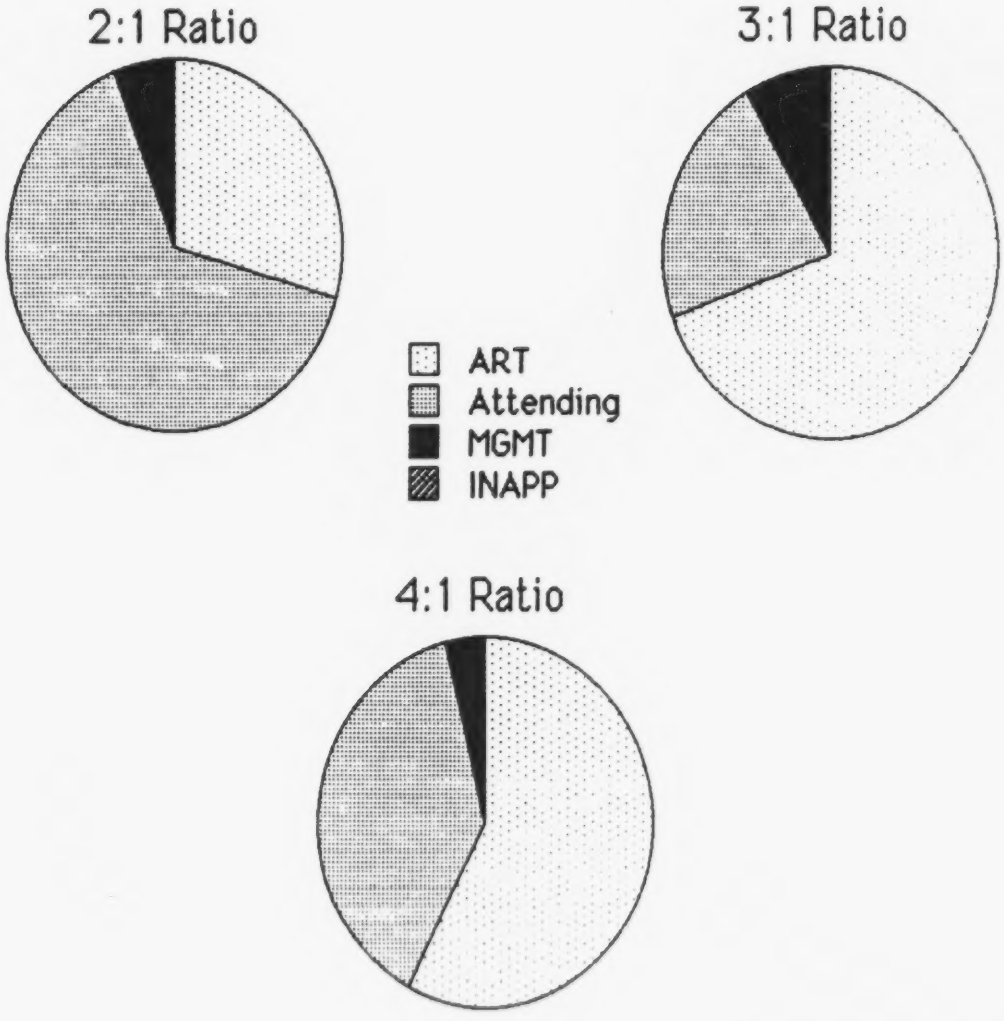

Figure 8. Silvia's Responses During 2:1 and 4:1 Ratios

Across the different ratios, some differences are evident in the types of academic responses Silvia was making. For example, the primary response in the 2:1 ratio was reading aloud. In both 3:1 and 4:1 ratios, Silvia's primary response was reading silently; in the 3:1 ratio this was followed closely by writing, thus bringing the ART in this student-teacher ratio to the highest level.

While in each of the different student-teacher ratios, Silvia was involved in at least two different content areas. In both 2:1 and 3:1, Silvia was involved with reading, math, and spelling; in 4:1, Silvia was involved in reading and spelling. Across the three ratios, Silvia spent 27 minutes on reading, 17 minutes on spelling, and 10 minutes on math.

Information on methods of instruction indicated that two methods were used in all three ratios. Independent work accounted for 17.6% of the time in the 2:1 ratio, 27.8% of the time in the 3:1 ratio, and 27.5% of the time in the 4:1 ratio. Practice/drill accounted for 35.3% of the time in the 2:1 ratio, 55.6% of the time in the 3:1 ratio, and 35.0% of the time in the 4:1 ratio. Teacher demonstrate, student demonstrate, seatwork was used only in the 4:1 ratio (22.5% of time). Discussion occurred as a method of instruction in both the 3:1 ratio (11.1% of the time) and the 4:1 ratio (15.0% of the time). Correcting papers occurred during 47.1% of the time in the 2:1 ratio and 5.6% of the time in the 3:1 ratio.

Summary

Silvia was in special education for reading and math in student-teacher ratios of 2:1, 3:1, and 4:1. Active academic responding was considerably higher in the 3:1 ratio compared to the 2:1 ratio, but there were minimal differences

in academic engaged time. Management time was relatively low in all ratios. No time was spent in inappropriate responses. Silvia made clear gains in reading, but lost in math and spelling. The degree to which the achievement gains were related to instruction in any one ratio is questionable. Perhaps more likely is a relationship between time devoted to reading (and the associated reading responses) and changes in achievement.

CASE #9: David

The Student

David is a 12-year-old, fifth grade boy who is classified as learning disabled and receives special education services in the resource room for approximately one hour per day. David is a minority student (Black) in an urban school district. Test data indicate a normal intelligence level (WISC-R full scale = 98; verbal = 96, performance = 101). Scores on the Behavior Rating Profile indicate significant behavior difficulties perceived by parents and the special education teacher. David himself perceives difficulties in the school environment much more so than at home or with peers.

The home learning environment for David was seen as very supportive of school efforts, one that fostered high moral standards and values, and one that provided a rationale for working hard in school. Furthermore, the principal characterized the community in which the student lived as also being fairly supportive of school efforts, Ratings indicated that David somewhat appreciated the value of hard work and education, and usually had a rationale for working hard in school. In contrast, however, raters did not see his attitude toward school and learning as positive. The special education learning environment was

seen as (a) providing a strong rationale for working hard in school, (b) having a task-oriented and humanistic teaching style, and (c) believing strongly that tne school makes a difference for its students. In contrast, David's learning environment was not characterized as having strong administrative leadership.

The Special Education Setting

David was scheduled to receive special education instruction in reading for approximately one hour. When observed, actual allocated time covered a span of 52 minutes. During the 52 minutes, about 2 minutes was transition time; 4 minutes were coded as language activities, 15 minutes as spelling activities, and 31 minutes as reading. Most of David's special education time was spent in a ratio of four students to one teacher (4:1); this ratio accounted for 40 minutes of allocated time. The remaining 12 minutes of allocated time was spent in a 2:1 student-teacher ratio. In actual numbers, David was in a group of four students with two teachers.

A unique physical setting characterized David's special education time. The special education "resource room" was actually to the side of a regular education classroom, which was being conducted at the same time by a regular education teacher instructing 27 students. It was run as a separate class during David's special education time. The arrangement was necessary because of space constraints in the school building.

Acnievement

BASIS percentile ranks (PR) and standard scores (SS) for grade and age norms are shown in Table 19. On this measure of achievement, David progressed over a year's time (Spring 86 to Spring 87) in standard score grade scores from 72 to 80 in reading and from 87 to 99 in math. Spelling standard scores

Table 19

Results of BASIS Achievement Testing for David

	Grade Norms				Age Norms			
	PR[a]		SS[b]		PR[a]		SS[b]	
Scale	1986	1987	1986	1987	1986	1987	1986	1987
Math	19	48	87	99	15	36	84	95
Reading	3	9	72	80	2	9	69	80
Spelling	5	5	75	75	6	6	77	77

[a]PR = percentile rank
[b]SS = standard score, where the mean is 100 and the standard deviation is 15.

remained a constant 75 from one spring to the next. In terms of standard score age scores, David progressed over the one-year period from 69 to 80 in reading and from 84 to 95 in math, with spelling remaining unchanged at 77. Percentile rank changes were similar. The number of words read correctly on a common reading passage almost doubled, from 37 to 73, with errors increasing only by one (3 to 4). On measures of task completion and task success during the observation, David attempted all items on two tasks (spelling words, 10 of 10, and writing skills test, 39 of 39). His success rate was 80% on the spelling task and 87% on the writing task.

Relationships

The types of student responses made by David in the 4:1 and 2:1 student-teacher ratios are shown in Table 20. It is interesting to note that while academic engaged time (AET) was much higher (92.5% vs. 77.0%) when David was in a 4:1 ratio, his active academic responding time (ART) was quite similar in the two ratios, but still slightly higher in the 4:1 ratio (45.2% vs. 41.3%). Most of the difference in David's academic engaged time in the two ratios was due to the greater percentage of time involved in attending responses in the 4:1 ratio (see Figure 9).

David's management responses and inappropriate responses accounted for greater percentages of time in the 2:1 (11.5% each) than in the 4:1 ratio (3.2% and 4.3%). His active academic responses also were different in the two student-teacher ratios. In the 2:1 ratio, the greatest percentages of time were spent in reading responses (reading aloud or silently), while in the 4:1 ratio, the greatest percentage of time, far above all others, was spent in writing responses. Thus, the 27.4% of time in the 4:1 ratio in writing represents

Table 20

David's Responses During Different Student-Teacher Ratios in Special Education

Response[a]	Ratio[b] READING/SPELLING 2:1	READING/SPELLING 4:1
Writing	--	27.4
Playing game	1.4	1.1
Reading aloud	17.1	--
Reading silently	15.7	1.6
Talking appropriately	1.4	8.6
Answering question	4.3	5.4
Asking question	1.4	1.1
ART	41.3	45.2
Attending	35.7	47.3
AET	77.0	92.5
MGMT	11.5	3.2
INAPP	11.5	4.3

[a]Separate academic responses and composites, active academic responding time (ART), academic engaged time (AET), management (MGMT) and inappropriate responses (INAPP), are given in terms of percentages of time in the ratio.

[b]Total time in the ratios were 12 minutes in 2:1 and 40 minutes in 4:1.

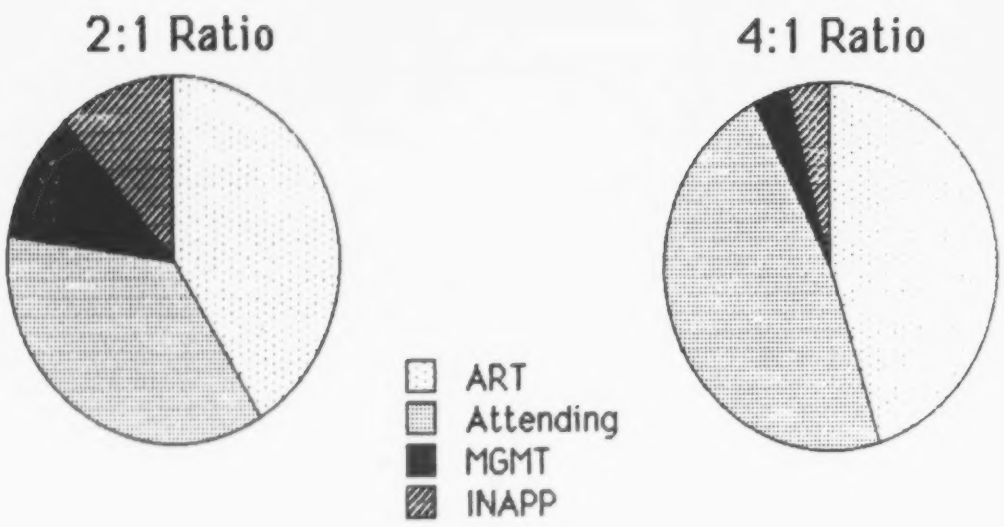

Figure 9. David's Responses During 2:1 and 4:1 Ratios

approximately 11 minutes, while the 32.8% of time in the 2:1 ratio in actual reading responses represents approximately 4 minutes.

Information on the methods of instruction used during the observed time in special education indicated that only two of the methods (discussion, practice/drill) were used in both the 2:1 and the 4:1 ratios. They were the only procedures used in the 2:1 ratio (25.4% of the 12 minutes was discussion, 74.6% of tne 12 minutes was practice/drill). Additional procedures used during the 4:1 ratio were lecture/films (9.5%), independent work (12.6%), and testing (15.8%). The major amounts of time were devoted to discussion (36.8%) and practice/drill (25.3%).

Summary

David was in special education reading instruction in 4:1 and 2:1 student-teacher ratios. Active academic responding was slightly higher in the 4:1 ratio (45% vs. 41%) and academic engaged time was considerably higher in the 4:1 ratio (92% vs. 77%). Other factors suggest that, for this student, the 4:1 ratio was more favorable. For example, both management time and inappropriate responding time were much lower in the 4:1 ratio (3-4%) compared to the 2:1 ratio (11%). On the other hand, if one were to place values on the nature of active academic responses and assume that it is more important for the student to practice reading than writing (even if in response to "reading" subject matter), the 2:1 ratio would be considered the more favorable one for this student. Clearly, David made some gains in achievement during the academic year. These gains possibly are related to the extra four minutes per day (if this advantage continues every day which, over a year, it would amount to slightly over 11 hours of extra actual reading time).

Discussion

The nine cases included in this case study analysis reflect the complex nature of students' active responding times as a function of differing student-teacher ratios in interaction with various characteristics of the student, the home environment, and the community environment. The case study approach, while allowing for more in-depth explorations of possible relationships, necessarily has limitations also. One obvious limitation is the small sample size. It is interesting to note, however, that it was not a simple task to find students who had received instruction in special education in different student-teacher ratios, particularly academic instruction. Of the 23 students for whom all student characteristics, home environment, and community environment data were collected, only 10 had been instructed in more than one student-teacher ratio for at least three minutes during special education time. One of these 10 received only social skills instruction and therefore was not included as a case study for this report. Apparently, a certain number of students is scheduled into the special education room at one time and instruction waits until that number is present. Only occasionally does a student enter or leave during an instructional period. This is considerably different from what occurs in the general education classroom.

A second limitation of the current study is the small amount of observation time in the special education classroom. This limitation, however, is a function of service delivery. Actual instructional times from start of observation to end of observation indicated that some students did not get their full amount of scheduled time. Examination of scheduled time, in fact, reveals

that the students in this study were scheduled to receive special education services for an average of 52 minutes, ranging from 30 minutes to 70 minutes.

Related to this point is the finding that the standardized achievement progress of the case study students over a one-year period was minimal despite the "extra" approximately one hour per day, despite the relatively good levels of active academic responding, despite the seemingly appropriate nature of instruction, and despite the relative absence of student characteristics that would interfere with learning. Perhaps the explanation lies with the achievement device used, which may be insensitive to changes over this time period. Yet, it might be expected that students would at least remain at about tne same level rather than showing extreme declines. The curriculum-based measure provided some indication of progress, at least in number of words read in a limited time period. Unfortunately, we do not have similar data on students who are not in special education. Perhaps their increase in words read over the same time period is three times as high. The apparent finding of little progress, except for a few instances, is disturbing.

In attempting to pull generalizations from this complexity, it is much easier to identify the kinds of relationships that do not exist than it is to identify relationships that do exist. First, it is necessary to examine students' active responding time in relation to differing student-teacher ratios. Table 21 is a summary of the active responding times for each case, as well as various other student, home, and school characteristics.

Most obvious from the ART data presented in Table 21 is the variability in tne percentages of time that students are making active academic responses, both across different student-teacher ratios for the same student, and across

Table 21

Summary of Case Study Variables and ART

Case	Gender	Race[a]	Aptitude[b]	Behavior[c]	Home[d]	School[d]	Comm[d]	% ART by Ratio								
								Ache	1:1	2:1	3:1	4:1	6:1	7:1	8:1	9:1
1 (Deborah)	F	NM	118	-	+	+	+	-	58.4	16.7	-	-	-	-	-	-
2 (Maureen)	F	NM	94	+	+	+	+	+	-	62.1	-	-	26.5*	-	-	-
3 (Craig)	M	M	X	0	+	+	+	0	-	-	42.4	-	-	-	24.7	-
4 (Jim)	M	NM	55	0	+	+	+	+	-	-	-	-	-	54.6	-	43.8
5 (Jill)	F	NM	97	0	+	0	+	-	-	-	35.5	68.4	-	-	-	-
6 (Paul)	M	NM	123	0	+	+	+	+	88.0	41.6*	-	-	-	-	-	-
7 (Joseph)	M	M	89	0	+	+	+	0	-	-	-	-	-	-	57.6	67.3
8 (Silvia)	F	M	83	0	+	+	+	+	-	29.4	69.0	57.6	-	-	-	-
9 (David)	M	M	98	-	+	0	+	+	-	41.3	-	45.2	-	-	-	-

[a]Race coded here simply as minority (M) and nonminority (NM).

[b]Full scale WISC-R IQ is provided in the aptitude column.

[c]A global rating of positive (+), negative (-), or variable (0) was assigned here, based on an integration of ratings by teachers, parents, and the student.

[d]Home, school, and community environments were given +, -, 0 ratings based on CLES information.

*Nonacademic subject area.

differing students within the same student-teacher ratio. For example, five of the nine students showed decreased percentages of ART as the student-teacher ratio increased, while three showed increased percentages of ART as the student-teacher ratio increased (one shows an increase then a decrease). The differences in these ART percentages for a single student ranged as high as 42% when academics were the focus in both of the comparison ratios. Within the same ratio, students differ in ART percentages by as little as 10% (1:1) and as much as 45% (2:1). The variability typically is about 30% difference between the highest and lowest ART percentages within a single student-teacher ratio.

Given this variability, one might expect that patterns in student, home, school, and community variables that relate to the variability could be identified. For example, if we look at those cases where the ART percentage increased with an increased student-teacher ratio (Cases 5, 7, and 9), it might be possible to identify some other commonalities. In fact, however, the commonality of increased ART percentage includes different amounts of increase. For Case 5, the difference is 22.9%; for Case 7, the difference is 9.7%; and for Case 9, the difference is just 3.9%. These three students represent youngsters with behavior problems (Case 9) and without behavior problems (Case 5 and 7). They represent youngsters who made progress on achievement in the content area covered during special education (Case 9), youngsters who stayed about the same (Case 7), and youngsters who showed decreases in achievement levels (Case 5). They include students with aptitude scores in the average range (one classified as EMR; two classified as LD).

For the cases where ART decreased with increased student-teacher ratio (Cases 1, 2, 3, 4, and 6), we see the decreases ranging from 10.8% to 46.4%.

Included are students considered to have significant behavior problems (Case 1), students considered to be without behavior problems (Case 2), and students who are given variable behavior ratings (Cases 3, 4, and 6). They represent youngsters who made progress on achievement in the content area covered during special education (Cases 2, 4, and 6), youngsters who stayed about the same (Case 3), and youngsters who showed decreases in achievement levels (Case 1). Included are students with aptitude scores in the below average range, in the average range, and in the above average range (one classified as EMR; four classified as LD).

Five of the students were observed in a 2:1 student-teacher ratio. Their percentages of ART ranged from 16.7 to 62.1. The extent to which the students with different ART percentages in the 2:1 ratio could be distinguished on the basis of other characteristics was examined. The students with the lowest percentages of ART (Case 1 - 16.7% and Case 8 - 29.4%) both had positive ratings on all conditions in the learning environment scales. One showed significant behavior problems and decreases in achievement over a one-year period. The other had variable indications of behavior problems, but showed gains in achievement over a one-year period. Aptitude scores for one were below average and above average for the other. The student with the highest ART percentage (Case 2 - 62.1%) had positive ratings for behavior and showed increases in achievement over a one-year period. This student also had positive ratings on all conditions in the learning environment scales.

Three students were observed in a 3:1 student-teacher ratio. The student with the highest ART percentage in this ratio (Case 8) is the student who had the second lowest ART in the 2:1 ratio, a student characterized by positive

conditions in the learning environment, variable ratings related to behavior problems, below average intelligence, and gains in academic achievement over a one-year period. The student with the lowest ART percentage in this ratio (Case 5) is a student with variable conditions in the learning environment, variable ratings on behavior, average intelligence, and decreases in achievement level over a one-year period.

Four students were observed in a 4:1 student-teacher ratio. The student with the lowest ART percentage was involved in a nonacademic content area (business management), a factor known by itself to reduce active academic responses (see Graden, Thurlow, & Ysseldyke, 1983). The next lowest ART percentage student (Case 9) showed variable conditions in the learning environment, significant behavior problems, average intelligence, and gains on achievement measures over a one-year period. The student with the highest ART percentage in the 4:1 ratio (Case 5) is the student with the lowest ART percentage in the 3:1 ratio, a student with variable conditions in the learning environment, variable ratings on behavior, average intelligence, and decreases in achievement level over a one-year period.

The data from the nine case studies do not produce any consistent patterns tnat would suggest one student-teacher ratio to be superior to another for students with certain characteristics. What do the case study data tell us?

One thing that the case study data tell us is that ART is a variable that is susceptible to change. It changes in relation to several variables, particularly the content area of instruction, the nature of the task, environmental distractions, and so on (see also Graden et al., 1983). The data also suggest that when ART is increased or decreased, the trade-off is usually

with the student response that has been called "passive attending." In general, the percentages of time taken by management behaviors or inappropriate behaviors remain about the same. These still may be relatively high, or relatively low, but for a given student, they remain about the same. What changes is the percentages of ART and attending time. As attending time increases, ART decreases, and vice versa.

The data also seem to indicate, once again, that the special education categorical label assigned to a student does not determine the effectiveness of different student-teacher ratios. Although the sample size was small in this case study analysis, the considerable inter-individual and intra-individual variability was quite clear. The indications here of few categorical differences is yet another set of findings that question the existence of and need for categorical differences (see O'Sullivan, Marston, & Magnusson, 1987; Ysseldyke, Christenson, & Thurlow, 1987a, 1987b; Ysseldyke, Christenson, Thurlow, & Bakewell, in press; Ysseldyke, Christenson, Thurlow, & Skiba, 1987; Ysseldyke, Thurlow, Christenson, & McVicar, 1988; Ysseldyke, Thurlow, Christenson, & Weiss, 1987).

The complexity of factors that can influence student performance is also indicated in the case study results. Clearly, student performance is influenced by more than simply the ratio of the number of students to the number of teachers.

Another thing the data tell us is that ART is not something that is automatically high just because a student is in special education. We know that, on the average, students have higher proportions of time in which they are making active academic responses when they are in special education compared to

general education classes (see Ysseldyke, Christenson, Thurlow, & Skiba, 1987). We also know that, on the average, students have higher proportions of time in which they are making active academic responses when they are in lower student-teacher ratios in special education than when they are in higher student-teacher ratios (see Thurlow, Ysseldyke, & Wotruba, 1988). But, these generalizations are based on averages. The case study results also seem to suggest that active academic responding time is higher when the method of instruction is some form of direct instruction.

We still do not know what percentage is the desired or optimal percentage for learning. In previous research, ART percentages averaged about 30% for special education students in special education settings, most of which were characterized by low student-teacher ratios (1:1 to 3:1). Thus, findings of ART percentages greater than 30% for seven of the nine cases observed in ratios of 4:1 or more is noteworthy.

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